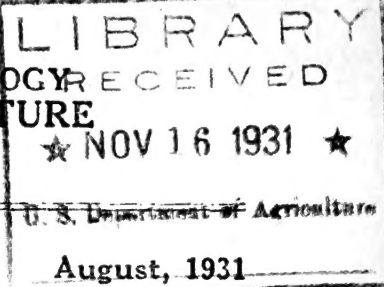


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MONTHLY LETTER OF THE BUREAU OF ENTOMOLOGY  
UNITED STATES DEPARTMENT OF AGRICULTURE



Activities for July

Number 208

(NOT FOR PUBLICATION)

FOREWORD

The Monthly Letter of the Bureau of Entomology for July, covering the month of June, has received a good many notes of commendation and one brickbat! It was a first attempt and had a number of faults. The worst of these was the incorporation of a considerable number of items which belonged in the Insect Pest Survey Bulletin.

The purpose of The Monthly Letter is to give the workers of the Bureau information as to what our men are doing, and so far as possible to give it in their own language. The circulation of these letters will be limited practically to the Bureau--in other words, it is distinctly a house organ. The notes will be based largely on results, and therefore announcements of work, or reports on work only partially completed, will not as a rule be recorded until some statement of outcome can be made. It is not believed that such publication of results will injure any worker, and on the contrary the statements crediting work to the men who are doing it, more or less in their own words, will establish an early title of the individual concerned to originality and credit.

Personal notices in the Bureau Monthly Letter will, therefore, be tied up with some accomplishment, in contrast to the old type which had degenerated very largely into personal notes applying only to the small percentage of Bureau workers who happened to have good press agents! The great majority went "unsung," although it was well understood that all of our men travel and receive visitors, or occasionally even voyage to Europe or win a golf cup! The full monthly report itself provides for information as to such personnel matters and as to visitors, etc., but The Monthly Letter will not hereafter be used as a vehicle to perpetuate such details. On the other hand, any personnel notes of outstanding importance affecting the Bureau as a whole or any of its component divisions will continue in the future, as in the past, to be made a matter of record. The list of additions to the Bureau Library will be continued as hitherto.

The delay in issuing the August Letter is due largely to the fact that it was prepared in the midst of the vacation period of summer--a period which also involved a great deal of extra-time work due to budget requirements. The September and October numbers should be out shortly, and after that a strong effort will be made to keep up to date.

C. L. Marlatt,  
Chief of Bureau.

## DECIDUOUS-FRUIT INSECTS

In connection with the technic of handling the apple-plug method of insecticide tests against the codling moth, E. H. Siegler, Tokoma Park, Md., reports that "we are now placing an unhatched egg with each apple plug instead of a newly hatched larva. This plan is a most convenient and satisfactory one, especially since we are now securing oviposition on waxed paper instead of on pear foliage. It is a simple matter to cut off a small piece of paper on which an egg has been deposited and to enclose it with an apple plug. This procedure insures the use of a newly hatched larva and obviates any possibility of injury to the larva."

Reporting on spraying experiments for the codling moth at Vincennes, Ind., F. H. Lathrop says: "A study of the chart (submitted) indicates that arsenate of lead alone was more effective against codling moth than arsenate of lead with hydrated lime. The addition of fish oil to arsenate of lead and lime in the third and fourth applications (second and third cover sprays for first brood) greatly increased the effectiveness of the insecticide. The summer oil sprays for the second brood do not show up well. There is reason to believe that the negative efficiency shown on the chart is not accidental. The low percentage of efficiency of the applications as a whole is striking."

Mr. Lathrop also reports that emergence of adults of the first generation was light during the period of July 1 to 11, with a slight increase during the week ending July 18. During the remainder of the month there was a rather steady, moderate emergence of adults. The first larvae of the second brood began leaving apples about July 25 to 27.

W. P. Yetter, jr., Vincennes, Ind., reports that "twig infestation (oriental fruit moth) continues to be light except in a few orchards. Moth catches are rapidly increasing, indicating a possibility of some commercial damage to Elberta, Hale, and Krummell peaches. The normal time of harvest will be a little later this year. Larvae are beginning to enter fruit to the extent that about 2 per cent of the crop is infested in the more heavily infested orchards. The oriental fruit moth population is lighter now than it was at this time last year but appears to be rapidly building up in spite of the drought which has existed for a number of weeks. Twig infestation is light in both the molasses-citral and methyl cinnamate-brown sugar blocks. The moth catch also continues to be light but is rapidly increasing."

L. F. Steiner, Cornelia, Ga., says: "Second-brood adult (oriental fruit moth) emergence and hatching of third-brood larvae were confined almost entirely to July. Fourth-brood larvae are expected to begin hatching before August 4. Elberta peach harvest will begin August 3. The drought in late May and June appears to have affected Oriental fruit moth development more than anticipated. Second-brood adults were only one and a half times as numerous as those of the first brood, in spite of the fact that second-brood twig injury was five times as abundant as first brood."

Reporting on the large-scale bait-trap experiment, Mr. Steiner says: "In 1,700 record traps in the large area only 330 oriental fruit moths were captured during July as compared to 220 captured during June. In 60 traps located in three widely separated check orchards the adult catch for June and July was 640 and 152 respectively. \* \* \* During July approximately 1,700 second-brood moths were captured by the 2,400 experimental bait traps. These traps captured over 1,500 first-brood adults during June. Oriental fruit moth injury is almost impossible to find in this orchard."

H. G. Butler, Harriman, Tenn., states that "over 300 parasites reared from field-collected oriental fruit moth larvae have been obtained during the past month. These are largely Macrocentrus delicatus, but a few specimens, as yet unidentified, are thought to be unrecorded from this district. During the past month there has been a considerable increase in degree of parasitism found in field-collected larvae. Macrocentrus ancylivorus has been recovered in an orchard in which this species was liberated last year." The experiment, carried on by J. L. Gardiner, in the recovery of marked moths is yielding better results following the use of certain new dyes supplied by Mr. Steiner. "The best recovery obtained up to the present time is 67 per cent of the moths liberated between July 20 and July 23. This work is seriously hindered by the lack of a sufficiently large number of dyes having sharp enough colors to permit of rapid and positive identification of the marked moths."

R. W. Burrell has submitted (July, 1931) an extended report on parasitism of Laspeyresia molesta in Australia, summarizing peach growing in Australia and parasitism, and giving detailed records of his findings and collections of different parasites. He discusses in some detail five important parasites, three of which, Gambrus stokesii Cam., Stomatoceras pomonellae Cam., and Goniozus antipodium Westw., he is collecting for introduction into the United States. Under "General Conclusions," he says: "There is little damage done by L. molesta in the areas of Australia where it has been present a number of years. The parasitism percentages results of one season's work hardly justify the belief that this condition is due to natural parasitism, but parasitism has been considered to be the reason, and there does not seem to be any other way of accounting for the lack of damage." At another point he states that "the crop damage in the Sydney area has been very light over the past ten years, and was similarly light last season," and that he "can not find any satisfactory explanation of this in any of the orchard management practices prevalent here." He states also that "damage over all the Sydney orcharding district for the past season was estimated by the Fruit Inspectors at between 5 and 8 per cent for peaches and nectarines." In the special discussion of parasitism and the relative merits of the parasites involved, he indicates that the total parasitism found amounts to 17 per cent.

The fourth, fifth, and sixth shipments by G. J. Haeussler from southern Europe of larvae for parasite rearing and of cocoons of certain parasites of the oriental fruit moth have come through in satisfactory quantities and in good condition. The rate of parasitism of the larvae

is disappointingly low, but emergence from cocoons satisfactory; for example, from 125 cocoons of P. vulnerator, 104, or 83 per cent, emerged. The shipments were received on arrival by J. K. Holloway, Moorestown, N. J.

H. W. Allen, Moorestown, N. J., reports that consignments of Copidosoma pyralidis from the fifth and sixth European importations were transshipped to H. S. Smith at Riverside, Calif., from Moorestown. The total number shipped were 1,114 colonies of pupae and 175 inoculated Anarsia larvae. The first of these arrived in good condition; the last has not yet been reported. From the Copidosoma shipped with the third and fourth consignments, Mr. Smith has reared and liberated in southern California approximately 15,000 adult parasites.

Mr. Allen reports also that the foreign parasite Ascogaster quadridentatus is being increased by insectary rearing previous to liberation. "The emergence increased from 118 in June to 3,984 in July. During July 211,000 host eggs were inoculated. Parasites emerging from this stock will be liberated in middle and late season peaches in August and September." The work on this parasite is being conducted by W. T. McAllister.

Mr. Allen states that a third shipment of 1,325 cocoons of the native species Macrocentrus ancyllivorus bred from oriental fruit moth larvae has been made to the French Ministry of Agriculture, through G. J. Haeussler. This is a return in kind for the opportunity and aid furnished in the collection in southern France of parasites for shipment to the United States.

John Gray, Moorestown, N. J., reporting on oriental fruit moth ecology, presents a table which indicates that from the collection of five blocks at Salisbury, Md., involving 50 bait pans, 5,753 moths were taken. From a similar series at Berlin, Md., 4,961 moths were taken--a total of 10,714, the largest collection of moths to date.

G. A. Runner, Sandusky, Ohio, reports that owing to a heavy overwintering brood, more than the usual damage has occurred from feeding of adults of the grape leafhopper during June and early July. Rains, however, caused a heavy vine growth and abundant foliage which has greatly lessened damage from the first brood of leafhopper nymphs.

Mr. Runner further states that "work on first brood (grape berry-moth) repression by cultural means, outlined in a previous report, has shown very promising results in several large-scale field tests. Cage experiments in vineyards with overwintered cocoons showed practically no emergence of moths from cocoons under comparatively shallow soil coverings, while emergence from control lots has been normal. Similar experiments with large numbers of cocoons of the summer brood are now under way. Tests of lead arsenate and calcium arsenate applied against



the first brood of berry worms in accordance with our present spray schedule, following vineyard cultivation planned to keep a soil covering over the overwintering cocoons until after the time of normal emergence of the first brood of moths, have shown very effective control."

Howard Baker, who is making investigations of the obscure scale (Chrysomphalus obscurus Comst.) on pecan at Shreveport, La., reports that 434 parasites emerged from field-collected material during July, a slight increase over the number emerging in June. Five species were represented in the collections, as follows:

<u>Prospaltella fuscipennis</u> Gir.	135
<u>Phycus varicornis</u> How.	30
<u>Prospaltella</u> sp.	197
<u>Ablerus clisiocampae</u> Ashm.	20
Miscellaneous	2

Mr. Baker has conducted a series of field spray tests on pecan foliage, involving the use of several different types of oils. He says: "In general the degree of injury increased with the viscosity of the oil used and the strength at which it was applied. No defoliation was caused in any of the tests and no injury was evident in any test involving the use of the so-called white oils. \* \* \* The injury was slightly greater in the series of tests applied under humid, cloudy weather conditions as compared to the series applied under clear, hot weather conditions. In general the higher-viscosity oils at the highest strengths used exerted the greatest, most lasting influence on the settling of crawlers."

Reports by C. B. Nickels, Brownwood, Tex., on the artificial liberations of *Trichogramma* for the control of the pecan nut case bearer state that liberations were made in three pecan groves in Texas in which almost all of the trees were budded varieties. The proportion of nuts infested by the case bearer on individual trees in the three groves would range from 5 to 30 per cent. Results of the experiments are as follows:

(1) *Trichogramma* placed on 31 pecan trees. Approximately 8,000 parasites released on May 28 and 5,000 parasites on June 6 on each tree; total number of case-bearer larvae on trees, 519; case-bearer eggs collected, 655; total number of eggs parasitized, 196, an average of 29.92 per cent.

(2) *Trichogramma* liberated on 13 pecan trees. Three lots of approximately 8,000 parasites each were released on each tree on May 23, May 31, and June 7; total number of case-bearer larvae on trees, 398; case-bearer eggs collected, 441; total number of eggs parasitized, 56, an average of 12.69 per cent.

(3) *Trichogramma* liberated on 29 pecan trees in this grove. On each tree approximately 8,000 parasites were released on May 24 and May 30, and 5,000 parasites on June 5; case-bearer infestation very light in this grove and an average of 13.6 per cent of the case-bearer eggs collected were parasitized.

## JAPANESE BEETLE AND ASIATIC BEETLE RESEARCH

I. M. Hawley, Moorestown, N. J., reports: "At Harrisburg, Pa., where geraniol traps to collect Japanese beetles are operated in cooperation with the Pennsylvania State Department of Agriculture, Aserica castanea Arrow has been taken in large numbers. When the traps on two city blocks were cleaned out 140 Asericae were found." This is the first record of this insect being taken in large numbers in this way.

In June an experiment under the direction of W. E. Fleming was started at Mount Holly, N. J., with 225 traps to test the relative efficiency of new and old bait in attracting the Japanese beetle, the effect of the color of the traps on their effectiveness, and other modifications of the standard trap. Mr. Fleming says: "In view of the comparatively light infestation of beetles at Mount Holly, over half of these traps were moved to Westbury N. J., where a greater number of beetles were available. This summer the green traps with white funnels and baffles are capturing more beetles than the standard all green traps, thus confirming the results obtained last summer. A trap made entirely of glass has been found to be 20 per cent more effective than the standard green trap. Traps painted with aluminum paint and traps with modified aeration holes did not materially differ from the standard trap in the number of beetles captured. Several new types of traps are being tested, but no definite results have been obtained to date. The nickel traps appear to be the most effective of any in use and are capturing two to three times as many beetles as the standard green traps."

Mr. Fleming also reports: "One hundred and twenty odoriferous materials have been tested in comparison with geraniol, but since none of these substances decreased the attraction of geraniol to the Japanese beetle even 50 per cent, these chemicals will not be considered further as repellents against the beetle. \* \* \* A rotenone solution was tested at dilutions of 1 to 100 and 1 to 200, but was found to be only slightly repellent to the Japanese beetle."

In work with foreign parasites, L. B. Parker, Yokohama, Japan, found that an improved method of feeding Tiphia with honey-saturated cotton wads has given an increased egg production and longer life of adults in rearing work in Japan. In Homebush, N. S. W., R. W. Burrell records a possibility of seven to eight generations per year with the parasite Palpostoma and a 25 per cent parasitism by this fly on Anoplognatus olivieri. In the domestic work, J. L. King, Moorestown, N. J., says, "it has been found that soil types have little effect on the average depth of cocoon formation in Tiphia vernalis. With Dexia ventralis, the original colony is found to be spread over a wider area than was suspected. Centeter cinerea has extended its range considerably this season and parasites are recorded as more abundant than last year; a parasitism of 23 per cent was recorded for June 22, but as beetles became more abundant this rapidly declined.



W. E. Fleming, reporting on control investigations of the Japanese beetle at Moorestown, N. J., says: "The laboratory work with hydrocyanic acid as a fumigant to destroy the adult Japanese beetles which accidentally infest green bananas during the process of loading the cars proved very satisfactory. Two cars were treated successfully in Philadelphia in the early part of July without any apparent injury to the fruit. The chemical analysis of fumigated bananas showed that there was little absorption of the gas by the fruit. On the basis of these results, recommendations were prepared for the treatment of bananas in this manner on a commercial basis. For some as yet unexplained reason, when this treatment was applied by inspectors of the Plant Quarantine and Control Administration, injury to fruit was reported on some of the cars. This phase of the matter is now being investigated."

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#### TROPICAL, SUBTROPICAL, AND ORNAMENTAL PLANT INSECTS

W. E. Stone, Mexico City, reports: "A device has been developed and practically perfected which will produce automatically in temperature chambers in this laboratory the varying temperatures as recorded by a thermograph at any locality where there is a possibility of the Mexican fruit fly becoming established. Extreme temperatures and the resultant effects can be shown, as they actually occur in the field. \* \* \* It may be possible to modify the apparatus so that humidity can be controlled as well as temperature."

Survival studies of Anastrepha serpentina Wied. at the Mexico City laboratory, which were formerly conducted by Mrs. H. H. Darby, have been continued by W. E. Stone. One female and 4 males are still surviving of the population which has been under observation for 11 months.

Adults of Anastrepha ludens Lowe, when fed on freshly cut mango, have shown normal survival, according to C. C. Plummer, Cuervanaca, Morelos, Mex. This is contrary to the findings of M. McPhail, who in 1929 reported rapid death of this insect on similar mangoes and concluded that some toxic material was being formed. Occasional populations fed on cut ripe oranges die very rapidly, however, and Mr. Plummer says: "It is suspected that such mortality may be caused by a disease, for the dead flies in such instances emit a very disagreeable odor."

A. C. Mason, Honolulu, T. H., is building up a stock of parasites of the Mediterranean fruit fly for shipment to the Citrus Experiment Station, Riverside, Calif., where an attempt will be made by H. S. Smith to utilize them in control of the walnut husk fly.

A study of the relative infestation of mangoes by the Mediterranean fruit fly and the mango seed weevil is being conducted at Honolulu by M. McPhail, who reports: "Since both the mango weevil and the fruit fly may be found in the same mango fruit at the same time, the question has arisen as to whether or not there is some relation between the two insects. During the month of July an attempt was made to determine the relation between the two pests; 1,840 mangoes were examined. Weevil and fly injury were recorded." So far, where weevil infestation is high, fly infestation has appeared to be low, and vice versa.

The vapor-sterilization room in the Honolulu laboratory is now in operation and experiments are being conducted with avocados, rose apples, mangoes, kamani nuts, and pineapple plants. O. C. McBride reports: "All fruit fly larvae were killed when subjected to 45° C. or above for 4 1/2 hours or longer. The infestation in the rose apples averages 13 larvae per fruit. Heating results are very similar to those of other fruits. \* \* \* Pineapple plants withstand very high temperatures. The pineapple mealybug kill was checked on 2 lots of plants. Lot No. 1 gave a very poor kill at 114° F. for 6 hours, relative humidity 98 per cent. When the relative humidity was reduced to 82 per cent a very good kill was obtained."

H. Marlowe, Honolulu, T. H., continuing toxicity studies with the Mediterranean fruit fly, has determined that "in order to secure 100 per cent mortality, flies must be very hungry or must feed over a period longer than 1/2 to 10 hours."

H. Mitchell, jr., Honolulu, reports: "A few tests on vacuum treatment of adult (Mediterranean fruit) flies indicated that, although flies exposed to a high vacuum for several minutes were rendered inactive, recovery would take place when they were returned to normal conditions. Exposure for more than 15 or 20 minutes is apparently fatal."

L. H. Dawsey and Arthur J. Haas, jr., New Orleans, La., who have been conducting experiments on the determination of oil retained on plant surface, report: "Work was started on this phase in June using the method given by L. L. English (Jr. Agr. Research, 41, No. 2, 131. 1930), but with camphor instead of satsuma leaves. The leaves of course contain a large amount of natural oils and waxes, some of which are extracted with the oil. It was found that the variation in this natural oil and wax content was so great in the camphor that an improved method of analysis had to be developed before satisfactory results could be obtained. The new method consists essentially in extraction as above, then cooling this extract to -20° to -30° C. and filtering. At this temperature most of the wax is solidified and separated in filtration. The chlorophyll in the filtrate is then destroyed by nitric acid, and the filtrate centrifuged to separate the oil, which is read volumetrically in calibrated skim milk bottles. Tests in which a known amount of oil was added have shown the initial quantity to be recovered, and very close agreement between different lots was secured. The method has been used successfully on pecan leaves also and is now being tried on leaves of other plants common in this region."

D. B. Creager, Babylon, N. Y., who has been conducting nutritional studies of Eumerus sp., reports: "Young larvae introduced on sterile bulb agar remain alive without development for over 4 weeks, attaining a length of a little over 1 millimeter, whereas the introduction of yeast or Fusarium completes the life cycle to the adult form within that same period of time."

C. F. Doucette, Sumner, Wash., reports that examination of 30,000 narcissus bulbs for Merodon equestris showed "the average infestation about 3.75 per cent," but that species of Eumerus "were very scarce

in the stocks examined, with an average percentage of infestation of 1/4 of 1 per cent. One lot of Emperor treated in 1930 in hot water with Ceresan added showed about 65 per cent with the centers injured and these were generally infested with Eumerus larvae. This is the only substantial source for Eumerus bulbs for fumigation and treatment experiments located as yet." Concerning experiments with poison-bait spray at this laboratory, Mr. Doucette says: "A small planting of bulbs sprayed with the formula used for cherry fruit fly in this section (arsenate of lead, brown sugar, molasses, and water) as mentioned in the May report, showed \* \* \* Spring Glory--2,818 bulbs, 2 infested with Merodon; and Emperor--2,979 bulbs, 2 infested with Merodon." Tests of vapor-heat sterilization in July involved the treatment of 25 tons of narcissus in the laboratory equipment and 42 tons in a commercial outfit under supervision of the staff of the laboratory.

In tests of pyrethrum extracts combined with dilute soap solutions for use against greenhouse insects, H. H. Richardson, Washington, D. C., reports that "the concentration of soap which gave good wetting and spreading qualities and yet did not produce any decided kill of aphids was determined. Against M. sanborni it appeared that 0.1 to 0.2 per cent soap (1,1-000 to 1-5,000) will give the desired effect. Dilution of a chemically pure soap solution with either tap water or distilled water did not appear to make any difference in the insecticidal action toward the black chrysanthemum aphid. The insecticidal action of the pyrethrins against the mealybug (Pseudococcus citri Risso) on coleus \* \* \* indicates that the pyrethrins in any of the combinations tested were not effective against the mealybug. \* \* \* Only very immature stages that had just previously hatched from the eggs were killed by these sprays." Of the many other insecticides tried against this insect, only the petroleum oil sprays gave any effective control.

E. A. McGregor, Lindsay, Calif., reports: "The almost unprecedented continuance of extreme temperatures acted to release at a high rate the toxic gases from the sulphur remaining on the citrus foliage, and this sulphur sublimation discouraged the natural restoration of the (citrus) thrips population, and contributed also to the reduction of the scale population." As for the seasonal development, eight generations of thrips had developed up to the end of July. Preliminary inspections of the sulphur-dusted plats as well as commercially treated ones reveal satisfactory protection from thrips attack with "almost no sulphur burn of fruit or foliage." In contrast, "untreated orchards as a rule are exhibiting more than the normal amount of thrips-scarred fruits."

P. A. Berry, Santiago, Cuba, reports that as a result of parasitism four groves in Cuba are now commercially free from the citrus black fly. Parasitism by Eretmocerus serius Silv. ranged from 60 to 78 per cents.

A report to the Governor of the Panama Canal on the condition of the timbers in the shipworm (Teredo) test plats at Balboa, C. Z., has been made by James Zetek. The report states that the only timber practically free from all growth was alazane (Calycohyllum candidissimum Vahl.), whereas timbers close to it were heavily coated. Samples of 20 different types were examined.

## TRUCK-CROP INSECTS

E. W. Jones, Walla Walla, Wash., reports: "Baiting for wireworms with ground wheat ball baits was continued this month in fields heavily infested with Limonius californicus. From 1,061 baits planted during the month a total of 14,527 larvae were obtained. This is an average of 13.7 worms per bait."

Mr. Jones also reports that in laboratory studies on submergence of wireworms, "it has been found that large larvae (2 to 3 years old) (of Limonius canus) may be submerged for 6 1/2 months at temperatures of 9°, 15°, and 20° C without dying. The young larvae submerged shortly after hatching are alive after 6 months in the water at 9° C. A few young larvae lived in the water 83 days at 12.5° C., 56 days at 15° C., 49 days at 20° C., and 43 days at 25° and 30° C."

F. H. Shirck, Parma, Idaho, states that larval-migration studies on wireworms have been completed at that laboratory. From these studies it has been learned that "wireworms tend to spread themselves more or less evenly throughout the area within which they may be enclosed," and that larval migration "is not influenced by the presence or absence of food." It was also found that wireworms are not "able to smell or otherwise detect the presence of baits in the soil\*\*\* That so many wireworms will collect at a bait in a comparatively short time is an indication that these larvae are very active, since much of the soil traveled through yields presumably little food."

In connection with the experiments in control of the sand wireworm (Horistonotus uhleri Horn.) at Fairfax, S. C., J. N. Tenhet reports: "Potatoes seem to be particularly susceptible to injury from the sandy-land wireworm. On an experimental plot of the late spring potatoes, of approximately one-third acre, which was very heavily fertilized, the yield was only 5 bushels of marketable potatoes. The total yield was 18 1/2 bushels, and of this total, 13 1/2 bushels were so badly marked with feeding punctures, or so underdeveloped, that they had to be thrown away. Without wireworms present, this plot should have easily yielded 50 bushels of No. 1 potatoes."

In the work with parasites, Mr. Tenhet says: "It has been discovered that approximately 8.5 per cent of all field-collected wireworms, this season, are parasitized by a nematode (Diplogaster sp.). This is particularly interesting on account of the extreme scarcity of records of wireworm parasitism. This nema has been taken from dead larvae and bred upon corn roots, decaying pea-vine hay, decaying crabgrass hay, decaying wheat bran, and decaying cottonseed meal. An attempt is now being made to reparasitize wireworms with nemas bred on the decaying organic matter."

R. E. Campbell, reporting studies made by himself and assistants on the life history and habits of the wireworm Pheletes californicus Lec. at the Alhambra, Calif., field laboratory, says: "Of eggs laid in the spring of 1930 (March or April), on Febr. 3, 1931, the larvae were divided

into two groups, those one-half inch long and one-fourth inch long, and put in different cages and fed wheat kernels monthly. From the one-half inch group, the first pupa was found July 22, and the first adult Aug. 4. From another group of eggs hatched on March 26, 1930, and fed a surplus of wheat, some were put in an 80° F. constant temperature cabinet on Feb. 6, 1931, and produced the first pupa on June 10, 1931. Another similar group kept at basement temperatures pupated on July 30, 1931. \* \* \* The average of 3.7 square feet shows a heavy wireworm population per acre. The low moisture content of the upper 6 inches of soil forced the wireworms to a lower depth than they otherwise would have been."

Rodney Cecil, Ventura, Calif., reporting on life-history studies of the lima bean pod borer (Etiella zinckneella Treit.), states that the higher temperatures during July accelerated the development of the pod borer. The average incubation period for 2,222 eggs during July was 7.2 days, varying with average daily the mean temperature. The average larval period was 17.6 days; the average prepupal period 7.6 days, while the average pupal period for 82 larvae was 19.2 days. The adults emerge during the night. In the cocooning racks, 60 per cent of the emerging adults were males. Mating, although not observed, apparently takes place in the night and fertile eggs have been collected from pairs confined in cages. The average preoviposition period during July was 7.1 days. Eggs are deposited during the night, the average number for 17 females being 39.1. It was found that the females live slightly longer than the males, the average longevity for the females being 17.6 days, and that of the males 15.7 days. Mr. Cecil says: "There was less than one per cent of parasitism of the larvae collected in lima bean pods from Summerland and the Rincon Mesa. The parasites are probably two species of Braconidae and two species of Ichneumonidae."

P. N. Annand, Twin Falls, Idaho, reports that "during the last two weeks in July a brood of the beet leafhopper (Eutettix tenellus Baker) in the beet field has matured, causing a marked increase in the numbers present throughout the entire district. This brood is made up mostly of the offspring of the migrating insects, but is undoubtedly increased in size by maturation of offspring of the overwintering bugs occurring in beet fields. \* \* \* Estimates on severely diseased fields indicate the presence of a minimum of ten bugs per beet." The first estimates of tonnage - 5.0 to 8.5 tons per acre - indicate the general condition of the crop. The "importance of overwintering bugs in the production of early cases of severe curly top is indicated by disease distribution in the Burley section." There "the severest disease in the early part of July was correlated with the highest numbers of early severe cases of the disease (caused by overwintering bugs) rather than with populations of spring migratory forms."

Experiments by C. F. Henderson and H. F. Cline, of the Twin Falls laboratory, in transferring curly top to beets from potatoes produced from last year's infested plants have established the fact that this disease is tuber transmitted in potatoes. These workers also report that bean fields in the vicinity of Twin Falls were practically free from the leafhopper by the last of July. "Curly top has occurred in a few



fields as abundantly as 24 to 29 per cent, but most fields are but little injured." This "lack of injury on beans is difficult to explain in view of that occurring on beets. It appears likely, however, that the difference between last year's injury and this year's may be explained on the basis of size of the initial migration, as the insects appear to remain in bean fields only a limited time."

In their work with egg parasites of the leafhopper Mr. Henderson and his assistants have found that the efficiency of these parasites is limited by the lack of proper host-plant sequence in the known desert breeding grounds. "The distribution of the two spring host plants of Eutettix tenellus, Sophia sophia and Norta altissima, is not identical with that of the summer and fall host, Salsola pestifer. Consequently the great bulk of egg parasites, upon emerging from dry S. pestifer in the spring, are not located in the large breeding areas of E. tenellus, and by the time they have become established and have reached sufficient numbers, practically all the eggs of E. tenellus which give rise to the first brood have hatched. A study of host-plant sequence is therefore essential in determining the limitations of the egg parasites now present and in addition will furnish important information relative to the introduction of any foreign species."

F. R. Lawson, Davis, Calif., has been working out methods for making a rapid survey of the extent of summer weed hosts of the beet leafhopper in the San Joaquin Valley. W. C. Cook, in charge of the Davis sub-laboratory, says: "He (Mr. Lawson) has adopted a method based on linear miles of vegetation seen on both sides of the road in traveling. \* \* \* At the present time he estimates 25,000 acres of weed hosts in Stanislaus County."

Mr. Cook also reports the checking of some experiments conducted by a California commercial spray company, "with a new type of machine which applies oil in the form of a fine fog, using air as a distributing agent instead of water. On July 21 a spray of light oil containing 10 per cent pyrethrum extract was applied on a thick stand of Atriplex bracteosa, south of Modesto. Mr. Schwing and myself checked the area before and after spraying and found that about a 95 per cent kill was obtained, using between 4 and 5 gallons of material to the acre. On July 31 some more extensive experiments were performed in the presence of the writer and Mr. Schwing. Several combinations of different oils with different amounts of pyrethrum and without pyrethrum were tried on beets which had high populations of bugs. A light oil, 5 per cent pyrethrum extract, gave 36 per cent control, with 6 2/3 per cent pyrethrum gave 59 per cent control, and with 10 per cent pyrethrum gave 95 per cent control. This last spray was at the rate of about 8 gallons per acre. These figures were checked by taking sets of 10 collections before spraying and again about one hour after the spray was applied. About a dozen cages of bugs exposed in different patches showed that the 10 per cent pyrethrum spray would give 100 per cent mortality, and also that the bugs would not again come to life. A spray with 2.3 per cent nicotine instead of pyrethrum gave about 50 per cent control, while the straight oil gave 30 per cent control. These results indicate that this method of application of oil shows con-

siderable promise, especially for operations in weeds and on perennials where plant damage is not important. There was very little evidence of damage to beets in this case, and I think an oil could be developed that could be safely applied to the young beets in the spring if this method of control is desired."

J. R. Douglass, Estancia, N. Mex., reports that emergence of Epilachna corrupta was practically completed by the end of July. He says: "Two distinct peaks of intensive emergence from hibernation occurred; the first from July 1 to 5, inclusive, and the second from July 18 to 20, inclusive. Periods of precipitation stimulated the beetles to emerge on the above dates." Mr. Douglass also reports the recovery of four of the 2,500 marked beetles of E. corrupta liberated in a mountain pass at an elevation of 8,700 feet on June 27. Two were recovered 4.5 miles and two 6 miles from the point of release.

A shipment of 500 puparia of the parasite Paradexodes epilachnae Ald., from Columbus, Ohio, was received by Mr. Douglass on July 19, and from this number 256 adults emerged. One hundred and ninety flies were liberated in the Mesilla Valley on July 28, after mating had taken place. Only 10 flies died during the long auto trip from Estancia to Las Cruces, N. Mex.

Neale F. Howard, Columbus, Ohio, reporting on the tachinid parasite, Paradexodes epilachnae Ald., of the Mexican bean beetle, says: "The peak of the first-brood larvae (beetle) appeared in the field near July 15, at which time it was possible to obtain sufficient host material for parasite work without resorting to winter methods of propagation. During the last week of the present month (July) larvae became scarce and material was sent to Columbus from other parts of the country. New beetles and egg masses are plentiful in the bean plots at the present time but larvae are scarce. Twenty-one thousand five hundred and fifty larvae were exposed to parasites during the month (July)." Four thousand three hundred and forty puparia were obtained at Columbus; 500 were sent to J. R. Douglas, Estancia, N. Mex., and 1,827 flies emerged in the insectary at Columbus. The hot weather shortened the life of the adult flies materially.

Owing to severe drought in the section, the experimental tobacco fields at Quincy, Fla., have shown extensive damage by thrips (Frankliniella fusca Hinds). F. S. Chamberlin reports that the damage in different crops has varied "from zero up to 50 per cent. A few crops of 1,200-pound yield have been reduced in price from 65 cents to 35 cents per pound. For some undetermined reason one of the new disease-resistant types (94) has been found to be far more susceptible to thrips injury than the other types grown in this region."

Mr. Chamberlin also states that in experiments in control of the tobacco flea-beetle (Epitrix parvula Fab.) it has been learned that "a light film" of the dust mixture of barium fluosilicate and voluminous silica, a mixture once thought unsafe for application to mature foliage, "may be applied to the leaves with the newly designed duster during the latter part of the season without undue risk. \* \* \* Tobacco treated in this manner can be harvested without permanent discoloration, even in the

absence of rain. \* \* \* The mixture has now been applied to 200 acres of shade-grown tobacco under a great variety of conditions. An entirely satisfactory kill has been obtained and no burn has been observed or reported." The value of this new control method had been estimated as follows: "Saving by elimination of burned leaves and by additional flea-beetle control, 7 per cent. Shade-grown tobacco in this immediate section, 2,700 acres; yearly average value, \$2,000,000; yearly saving, \$140,000."

"During this month (July)," writes J. U. Gilmore, of the Clarksville, Tenn., field laboratory, "chemotropic control of the green June beetle adult was attempted in a small area near Guthrie, Ky., where the larvae of this beetle have done considerable damage in former years. As a result of previous observation upon this type of control, a series of 30 flat pans were placed upon stakes about 4 feet long. These pans were of 2-quart size, and 1 1/2 quarts of the following mixture was placed in each pan: Brown sugar, 2 pounds per gallon of water. During the first week of the experiment, only water was added to the pans to increase the quantity of the fluid so that the June beetles could be drowned in it, which was the method of retaining the catch. Later, new batches of brown sugar mixture were added from time to time. In the last few days of the experiment, honeybees seriously interfered by carrying away the mixture." The total number of Cotinis nitida caught during July was 9,820.

Harvest of the 1931 field experiments for the control of the seed-corn maggot as a pest of newly planted seed potatoes was completed the first week in July. The work was conducted by W. J. Reid, jr., in co-operation with the U. S. Bureau of Plant Industry, and was located at Charleston, S. C., Chadbourn, N. C., and New Bern, N. C. Mr. Reid says: "The field control experiments of the 1931 season were confined almost entirely to tests of the value of seed suberization, or corking, in advance of planting as a means of preventing seed-corn maggot injury to seed potatoes. This process gave very promising results as a control measure in experiments of three previous seasons. The results of the 1931 tests were also very encouraging. In each of the 12 different field control experiments potato seed suberization in advance of planting gave excellent, 98.86 per cent, control of the seed-corn maggot."

On the control of the European earwig, S. E. Crumb, Puyallup, Wash., reports: "Recently we have had an opportunity to determine the feasibility of controlling earwigs after they have taken up their abode in beehives. It is known that earwigs are fond of honey, and it was feared that they might remain permanently in the hives, where control might be quite difficult. Strange to say, the bees do not seem to resent the presence of earwigs, since the earwigs are often found in situations such that the bees could readily attack them. Dissections of stomachs of earwigs from beehives gave evidence that they had fed freely upon the honey, but in every case the stomachs contained a considerable amount of vegetable matter, indicating that the earwigs found it necessary to leave the hive to obtain a portion of their food. Acting upon this indication earwig bait was scattered about the hives with excellent results."

## FOREST INSECTS

The susceptibility of drought-affected trees to insect attack is being noted at Ashville, N. C. From this point R. A. St. George reports: "Upon the request of C. D. Beadle, manager of the Biltmore Estate, some fifty Bohtan pines were examined for insect attack. It was determined that this introduced pine was being attacked by Ips calligraphus and other beetles usually associated with weakened trees. It is believed that the severe drought of last season, combined with the one of this year, weakened them sufficiently to attract these secondary beetles to them. The injury was first noted last fall, it becoming much more severe this summer. The surrounding native white pines which are considered to be much more hardy were not affected."

L. G. Baumhofer, Halsey, Nebr., reports that Campoplex frustranae Cushman, which was introduced into the Nebraska National Forest from Virginia in 1925 as a parasite of the pine tip moth (Rhyacionia frustrana Comst.), and which has been spreading naturally and demonstrating increased parasitism since that time, showed a general reduction in numbers this season. There was some increase in moth population.

Of other insect pests in this region Mr. Baumhofer says that the seriousness of a heavy grasshopper infestation in the Nebraska National Forest became evident early in July. "Yellow pine trees as old as seven years in the field were having branches partially girdled and patches of bark on the bole badly eaten. \* \* \* The Forest Service has been carrying on control with poisoned bran mash, to protect about 1,000 acres of well-established young plantations of these trees."

The aerial war against the hemlock looper (Ellopiia lugubrosa Hbst.) in southwestern Washington was begun by F. P. Keen and M. J. Buckhorn on July 3, when a monoplane started spreading calcium arsenate dust over the infested area. Mr. Keen says: "The outbreak of the loopers had given promise of being a major forest catastrophe, for in three years' time more than 7,200 acres were known to be infested with a tenfold increase each year. \* \* \* A 65 per cent reduction was secured on one set of traps in the first few days following the application, and this was gradually increased to a 70 per cent reduction two weeks after the dusting had been completed."

H. J. MacAloney, Amherst, Mass., reports the results of a trip made in July to the islands of Martha's Vineyard to carry out direct control of the white-pine weevil (Pissodes strobi Peck). He says: "Eighty-one infested leaders were removed. \* \* \* This is an increase of about 30 over last year and can be explained chiefly by the fact that a new infested area was discovered this summer. \* \* \* It is expected that next year the infestation will be considerably decreased."

R. C. Brown reports concerning the importation of tachinid parasites, the last shipment being received at the gipsy moth and brown-tail moth laboratory on July 17: "The following is a list of the various

tachinid species, reared from Porthetria dispar in Europe, received in 1931, with the numbers of puparia of each species:

<u>Phorocera agilis</u> R. D.....	151,225
<u>Sturmia inconspicua</u> Meig.....	6,182
<u>Sturmia scutellata</u> R. D. ....	5,878
<u>Carcelia separata</u> Rondani .....	3,695
<u>Tachina larvarum</u> L. ....	1,763
<u>Compsilura concinnata</u> Meig. ....	760
<u>Lydella nigripes</u> Fallen .....	635
<u>Actia</u> spp. ....	587
<u>Zenillia libatrix</u> Panzer.....	217
<u>Ernestia</u> sp. ....	6
Undetermined species .....	7

Total of all species ..... 170,955

J. A. Millar, Melrose Highlands, Mass., reports that 1,000 puparia of Compsilura concinnata were shipped to R. W. E. Tucker, Barbados, B. W. I., for colonization against armyworms and cutworms; and the same number to C. F. Doucette, Sumner, Wash., and A. B. Baird, Belleville, Ont., for colonization in infestations of the satin moth (Stilpnotia salicis L.).

M. F. Sellers, Budapest, Hungary, makes the following report on gipsy moth parasites: "From a total of 400,000 gipsy moth larvae collected at Oszro, Hungary, about 98,000 tachinid puparia, mostly Phorocera agilis R. D., were obtained and sent to America. A total of 230,000 gipsy moth larvae, collected at Oberpullendorf, Austria, gave about 60,000 tachinid puparia. These were sent to America. P. agilis was the predominant species."

Mr. Sellers also reports that from a total of 331,000 gipsy moth larvae collected at Galgamacsza, Hungary, about 10,000 tachinid puparia, chiefly Sturmia inconspicua, were secured, and that "From 6,000 satin moth larvae collected at Lagymanos (Budapest), Hungary, the following parasites were reared: 2,168 Meteorus sp., 12 Rogas unicolor Wesmael, 2 Apanteles solitarius Ratz., 719 Tachina larvarum L., 78 Pales pavidus Meig., and 2 Carcelia gnava Meig."

T. T. Terrell, Coeur d'Alene, Idaho, reports that on July 9 and 10 an aerial survey was made of the forested areas of the Yellowstone National Park. The purpose of this reconnaissance was to determine the extent of the outbreak of the mountain pine beetle in the scenic lodgepole pine forests of that region. Mr. Terrell says, "It was found that the infestation within the Park is far more widespread than had been previously anticipated and that more intensive surveys of the infested areas will be necessary. \* \* \* Glick insect traps were carried for the purpose of ascertaining what insects could be collected at different elevations above the ground."



J. M. Miller, Berkeley, Calif., reporting on a regional survey of bark-beetle infestations says: "An examination was made of the mountain pine beetle infestation around Medicine Lake, in the Shasta National Forest, July 4 to 6, by Mr. Salman and Phil Johnson. This infestation was found to be continuing at about the same momentum as in 1930. \* \* \* The survey party completed the 1931 sample plot and strip work on the Modoc and Shasta Forests by July 19. At that time the 1931 tendencies of the western pine beetle infestation were becoming evident on these areas. \* \* \* All indications point to an aggressive and increasing infestation. The base for this survey work was moved to the Sierra National Forests in central California July 20. \* \* \* Conditions found here indicate that the epidemic of western pine beetle infestation started in 1930 and has already advanced to a point where the 1931 losses are far greater than any that have previously occurred in the history of the area."

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#### CEREAL AND FORAGE INSECTS

"The grasshopper situation in South Dakota and Nebraska continued to grow more serious during July," says J. R. Parker, Bozeman, Mont., "and requests for assistance from this station were also received from Iowa and North Dakota. R. L. Shetwell was in South Dakota from July 10 to July 30, acting in an advisory capacity to State and county officials and carrying on experimental work.\*\*\*"Due to delays in securing an effective poisoned bran mash in sufficiently large amounts before grasshoppers reached the adult stage, the control campaign in South Dakota and adjacent territory in Nebraska was not successful and in a large area many crops were completely destroyed. Large-scale poisoning operations have been given up for the season and our efforts for the remainder of the season will be directed toward finding out where and how many eggs are being laid. This information will be absolutely necessary in planning for an intelligent control campaign next year."

Iowa State officials were taken through the devastated areas in Nebraska and South Dakota and were accompanied back to Iowa by J. R. Parker, who states: "In the vicinity of Missouri Valley, Iowa, cornfields were found seriously damaged by the same species of grasshoppers (Melanoplus bivittatus Say and M. differentialis Thos.) that had devastated South Dakota and Nebraska. Several control demonstrations were made and State officials were informed of the serious situation that existed. Fifty thousand dollars was made immediately available and prompt measures were taken to wipe out the Iowa infestation."

T. E. Holloway and W. E. Haley, in cooperation with their parasite collector in Peru, have devised a new method of shipping the *Ipobra-*

corn wasps (I. rimac). Mr. Holloway says: "Mr. Jaynes has been sending them in cans 5 1/4 by 10 3/4 inches, two cans to a crate. Though sent by airplane, reaching us in six days, the shipments have mostly been unsatisfactory, the survival being sometimes as low as about 1 per cent. It seemed to make little difference as to whether or not the cans were with or without screened openings to allow for air. At last Mr. Jaynes sent a crate alone, 5 3/8 by 8 3/4 by 10 3/4 inches, without cans, the sides being screened and covered with black cloth to reduce the activity of the insects. This cage was a great success. Out of 980 wasps sent, 550, or 56 per cent, reached us alive."

C. M. Packard and W. B. Noble, West Lafayette, Ind., made a study of widespread injury to lawns and golf greens by sod webworms during the month of July. "Several species are involved, as shown by our rearings, probably Crambus mutabilis Clem., C. trisectus Walk., and C. caliginosellus Clem., although authentic determinations have not yet been received from Washington. Wild birds and chickens have been observed digging up and eating the larvae. A dipterous parasite is common but not present in controlling numbers."

The following report on eggs collected by J. C. Frankenfeld, in the range caterpillar (Hemileuca oliviae Ckll.) territory, in the vicinity of Tempe, Ariz., is submitted by him: "Adult Anastatus semiflavus Gahan have been recovered from 10 widely separated localities within the range caterpillar infested area. As stated in a previous report (May, 1931), range caterpillar eggs were collected from 16 localities. Heaviest parasitism occurs along the eastern and southern borders of the New Mexico infested area, principally around Clayton and Carrizozo, N. Mex. Although occasionally adults are still emerging, it is safe to state that not more than 3 per cent parasitism will be found in any of the 16 localities."

E. G. Davis, Tempe, Ariz., reports: "The second generation of the southwestern corn borer (Diatraea grandiosella Dyar), which is the one which causes the greatest damage to corn, was practically controlled this year in southern Arizona by the egg parasites - Trichogramma minutum and Prospaltella sp. Corn borer eggs were very numerous and the resultant larvae would have caused considerable damage had it not been for the activity of the egg parasites. A check of the eggs showed that 92 per cent had been parasitized, and of these parasitized eggs 50 per cent were by Prospaltella sp. and 42 per cent by T. minutum. Although corn borer eggs were numerous in the fields, it was difficult to find unparasitized eggs."

In an effort to determine the effect of the wheat joint worm (Harmolita tritici Fitch) upon the yield of wheat, T. R. Chamberlin collected samples from six preharvest wheat fields in Oregon. The heads were then sorted according to whether they came from stems free from infestation or from stems with one two or three infested joints. The results are reported as follows: "Wheat from one of these samples has been hand threshed and weighed. This sample indicates a reduction in yield of 22.2

per cent in the case of stems containing one infested joint, 31.6 per cent for those containing two infested joints, and 42.1 per cent for those containing three infested joints. According to these findings, the reduction in yield for the whole field, taking into consideration the relative numbers of each kind of infested stem in the field, was 21.1 per cent."

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## COTTON INSECTS

In general the infestation by the cotton leaf perforator (Bucculatrix thurberiella Busck) is much lighter this year than last, according to T. C. Barber, Calexico, Calif., who says: "This is mainly due to the improved methods which have been adopted this year, including plowing of the land, the use of imported high-class seed, thorough early cultivation, etc. However, the excessive heat also appears to have had a certain restraining effect upon the infestation. \* \* \* During the last few days of July, there were indications of an increase in general infestation corresponding to a drop in temperatures to normal conditions."

Mr. Barber also reports: "For the second month the results attained in the use of a sticky flight screen erected (at Calexico) for the purpose of attempting to capture perforator moths in flight were entirely negative, not a single moth of this species having been caught to date. As the screen is located on the corner of a cotton field in which perforator infestation has been observed all spring, it is evident that the method is valueless for the purpose for which the screen was erected."

Studies on the parasitism of the cotton bollworm (Heliothis obsoleta Fab.), as reported by E. W. Dunnam, College Station, Tex., revealed that the natural parasitism of Heliothis eggs by Trichogramma minutum Riley was practically nothing on either corn or cotton. Mr. Dunnam says: "The highest egg count per 100 silks never ran above 749 eggs in any survey. This lack of concentration was probably responsible for the lack of egg parasitism. \* \* \* Several releases of parasites were made in various cornfields. Weekly records were kept around points of releases and at various distances. Thus far, there is no evidence in favor of artificial parasite releases. This was probably due to the lack of eggs to be parasitized, and natural parasitism and predators. It was found that if the release capsules were not placed in fields until the day before the parasites began to emerge, the capsules would not collapse." Collapse of the capsules seems to come after their exposure to the weather for 3 or 4 days.

W. S. Cook, Tallulah, La., has been continuing work on the artificial inoculation of cotton plants with substances in the heads of various plant-sucking insects, including the cotton flea hopper (Psallus seriatus Reut.,) and the tarnished plant bug (Lygus pratensis L.) to see whether lesions could be produced similar to those characterized by "hopper damage" as occurring on cotton in the field. He has made some attempts to extract the salivary juice from the insects, but so far the

most satisfactory method of making the inoculation is to remove the entire head from the insect, grind it up, and place it in normal salt solution. Inoculations have been made using normal salt solution, 2.5 per cent hydrochloric acid, and the ground heads of Lygus pratensis L. or Psallus seriatus Reut. in salt solution. Mr. Cook says: "All inoculations were allowed to develop in the field for 5 days and daily notes were taken on them. After the fifth day they were brought into the laboratory and given a thorough examination under the binocular. Most of the inoculations were sectioned freehand, placed in formalin-acetic-alcohol and kept until they could be stained and permanent slides made. Inoculations showing good damage were not sectioned freehand, but the entire damaged area was cut from the petiole and placed in formalin-acetic-alcohol. This material will be later run up in paraffin and sectioned in the microtome."

At the Tullulah laboratory, P. A. Glick, J. M. Yeates, and assistants made 35 airplane flights during July, collecting insects, using a total of 27 hours and 30 minutes in the exposure of the screens. They report a total of 250 insects collected in the upper air. Among the more interesting records of insects taken are: At 200 feet, 1 large pentatomid, 23 winged ants, 1 honeybee, 1 Ceratomegilla fuscilabris Muls., 1 Stictocephala festina Say (alive), and 1 Geocoris punctipes Say; 2 Arctocorixa modesta Abb. at 500 feet and 1 at 1,000 feet, and 1 species of Chrysopa at 2,000 feet. The last four were taken during night flights. On the same days and nights that insects were collected by airplane, sweepings were made to collect insects on the surface, so that they may be used for comparative studies.

K. P. Ewing, Tallulah, La., reports: "Sweepings were made at weekly intervals on about 24 weed host plants and cotton to determine the population of Psallus seriatus Reut., Lygus pratensis L., and Adelphocoris rapidus Say on their respective host plants. A total of 400 sweeps was made on Erigeron annuus during the first 2 weeks in July, resulting in an average of 1,920.5 Lygus pratensis per 100 sweeps. Sweepings were discontinued on this plant about the middle of July, due to the plant dying out. The average numbers of Lygus pratensis per 100 sweeps on red clover and alfalfa were 138.4 and 167.5, respectively. A total of 500 sweeps on Croton showed an average of 654.2 Psallus seriatus per 100 sweeps." Results of weekly sweepings on cotton in the vicinity of Tallulah show a gradual decrease in mirid population, from 23.4 mirids the first week in July to 13.7 the last week.

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#### INSECTS AFFECTING MAN AND ANIMALS

E. W. Laake investigated an outbreak of blood-sucking midges in the vicinity of Little River and Temple, Tex., in July. He found engorged females in considerable numbers on the walls of poultry sheds and houses. The midges apparently do not attack man, but poultry are suffering greatly from their attack. Fifteen young turkeys on a farm near Little River were killed by these insects in one night.

The total catch of all species of blowflies, including the screw-worm fly (Cochliomyia macellaria Fab.), taken by D. C. Thurman and S. M. Perry in the trapped area near Menard, Tex., during the latter part of June and the first half of July, was 1,982.5 quarts. H. E. Parish reports 135 new cases of screw-worm infestation in the trapped area as compared with 215 in the nontrapped area.

H. H. Stage, Portland, Oreg., reporting a study on the effectiveness of oils in mosquito control, says: "These trials demonstrated the following results: First, that all oils killed the first day of application; second, that all the Diesel oils killed the second day after application; third, that the lighter oils gave partial kill the third day; and fourth, that no oil gave any real amount of protection thereafter. (The 'Mapco' larvicide completely lost its effectiveness after the first day.)

"The spreading qualities of the 14 oils were tested by dropping 0.1 cubic centimeter of the oil sample while held an inch above the water surface. Measurements were then made of the diameter of the circle formed by the oil. Several tests were made with each oil, both in clear and in muddy water. \* \* \* The average spread of all oils tested was 11.6 centimeters in clear and 8.3 centimeters in muddy water. The spreading qualities of the various oils were further tested by adding 5 per cent of the larvicide, 1 and 2 per cent crude carbolic acid, and 1 per cent cresylic acid (97 per cent pure). Tests were made both in the laboratory and in the field. It was found that an addition of 5 per cent of the 'Mapco' larvicide or an addition of 2 per cent crude carbolic acid increased the spread of the Diesel oils from 10 to 20 per cent. The 1 per cent crude carbolic acid and 1 per cent refined cresylic acid gave a very slight increase if any. It was further shown that the addition of larvicide or carbolic acid did not noticeably add to the killing power of the oil, but that oils containing 5 per cent larvicide or 2 per cent crude carbolic acid did cause the oils to spread quicker and better than the same oil without the addition of such material. It was also shown that the addition of such material greatly increased the efficiency of the oil under field conditions, especially where the vegetation or debris was heavy."

Some very interesting studies of breeding places of sand flies have been conducted at Charleston, S. C., by W. E. Dove and assistants. Based on studies of samples of muck obtained from marshes, it is found that the development of sand fly larvae is restricted to areas which receive enough seepage to retain moisture, that otherwise larvae are found only in shaded areas in the edges of marshes, and that throughout the summer sand flies have been recovered only in the low areas which did not become dry. The significance of this situation in control is noted. Further reports are also made on the efficiency of creosote oil and related products. It is reported that a mixture of these products in the laboratory killed sand fly larvae in dilutions of 1 to 2,500 and that this product is fairly soluble in water. Field spraying tests with this are being instituted which, as pointed out, if successful will involve principally the labor cost.



# STORED-PRODUCT INSECTS

As a result of cage tests for the dried fruit beetle (Carpophilus hemipterus L.) at Fresno, Calif., Dwight F. Barnes has found that ortho-chlorophenol and oil of pennyroyal "have a definite repellency to the adults." The report says: "Other materials tested were creosote carbonate and a(lpha)-chloronaphthalene. Each test was repeated at least three times, the treated and control food (fermented dried peaches) being placed in different locations in the shaded cage in order to eliminate the influence of light intensity."

Perez Simmons, Fresno, reports: "Increased numbers of Ephestia spp. were caught in traps in vineyards, as summarized in the following table prepared by Mr. Barnes. Five traps were operated in each vineyard. In addition to dried-fruit Lepidoptera, considerable numbers of miscellaneous insects were captured. Water controls in Vineyard A caught practically nothing."

Collection date	Vineyard A		Vineyard B	
	Total moths	Average per trap per day	Total moths	Average per trap per day
June 26	123	8.2	17	1.1
29	101	6.7	7	0.5
July 2	198	13.2	38	2.5
7	396	15.8	92	4.6
12	339	13.6	50	2.0
15	271	18.0	26	1.7
18	171	11.4	31	2.1
21	41	2.7	38	2.5
24	70	4.7	19	1.4
Summation	1,710	11.0	318	2.1

Mr. Simmons also reports that in July eight dried-fruit establishments in the San Joaquin Valley were examined. Adult moths of Ephestia and Plodia were found to be present in small numbers, but no larvae were found. Except for ants, which were abundant at one plant, insect enemies were at a very low ebb. "The exceptionally high temperatures that prevailed during July were probably considerably in excess of the optimum for development."

The tobacco moth (Ephestia elutella Hbn.) has caused less damage to leaf tobacco this year than in 1930, according to a report from W. D. Reed, Richmond, Va., who says: "It is apparent that our experiments during October, 1930, against this pest were effective."

The effect of paradichlorobenzene upon the viability of certain seeds in experiments at Sligo, Md., is reported by George W. Ellington, as follows: "Germination tests have been continued with different varie-

ties of seeds, previously treated with paradichlorobenzene, in order to determine whether this fumigant will injure seeds for planting purposes after having been fumigated against insect attack. After seven months constant fumigation, some varieties of seeds have shown a considerable reduction in viability, as compared with checks kept under similar conditions."

C. B. Wagner conducted experiments in the combined use of heat and hydrocyanic acid gas for the fumigation of a large flour mill in Kansas City, Mo., on July 3, 4, 5, and 6 under a cooperative arrangement with the milling company. A total space of 1,332,221 feet was under fumigation and the total time of exposure was 71 hours. Owing to a strong wind, killing temperatures were not reached on the third, fourth, and fifth floors until midnight of July 5. Mr. Wagner says: "Temperature at this time seemed to have penetrated accumulations, and piles of insects were noted about concrete pillars where they had been hunting cool spots. The temperature finally became lethal and the insects had dropped to the floor." It was necessary to fumigate the first floor with hydrocyanic acid gas, since there were no heating lines on this floor, and Mr. Wagner reports: "A 92 per cent kill of confused flour beetle was obtained in the (elevator) boots. The accumulation, however, protected the beetles to such an extent that it was impossible for the gas to penetrate in such places."

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#### TOXICOLOGY AND PHYSIOLOGY

Results of studies on responses of blowflies in a wooden olfactometer are reported by N. E. McIndoo, Takoma Park, Md., as follows: "Using *Lucilia* and *Calliphora* I have finished the 4 curves for 2 fermenting sugar solutions containing wild yeast. A curve representing the average of these rises rapidly and on the fourth day of fermentation, reaches its peak (76 per cent), then slowly descends and crosses the neutral line between the 17th and 18th days, and on the 25th day the sour liquids were 72 per cent repellent. Two curves each were obtained by using lactic acid, ammonia water, and milk (fresh and sour)."

Mr. McIndoo also made a study of the food preferences of potato beetles last summer, conducting 48 tests with the larvae and 24 tests each with the males and females by feeding them portions of leaves of the potato plant (*Solanum tuberosum*), horsenettle (*S. carolinense*), bitter nightshade (*S. dulcamara*), and tomato (*Lycopersicum esculentum*). It was shown that in general the males and larvae prefer the horsenettle, one of their native food plants, to their adopted one; while the females prefer their adopted food plant, the potato.

M. C. Swingle, of the Takoma Park laboratory, reports an experiment made to determine whether newly hatched larvae of the codling moth

could be reared in an agar medium, and, if so, to determine conditions necessary for their normal growth and development. "A series of newly hatched larvae were placed in vials containing jelled agar 50 per cent and green apple juice 50 per cent. Another lot was placed in vials containing jelled agar alone, covered with a thin apple skin. In all cases the larvae penetrated the agar and lived for a period of time. Mortality was high but a few of the larvae are still alive and will probably pupate."

D. E. Fink, who is engaged in a study of the anaerobic metabolism of insects at the Takoma Park Laboratory, reports the installation of a new device "which," he says, "makes the water bath suitable for experimental work in a room whose temperature is considerably above that desired for an experiment. The device depends upon the installation of a magnetic water valve in the system, controlled by a relay in such a manner that a spray of cold water automatically cools the bath and a heating unit acts in the opposite manner. So far as is known, this bath is the only type having this arrangement installed to work automatically, and electrically controlled."

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#### BEE CULTURE

Professor C. R. Kellogg, Entomologist, Fukien Christian College, Foochow, China--now appointed Field Assistant at the Somerset Laboratory--brought with him from China some living bees of the species Apis indica Fab. in order to study under American conditions the life history, growth, development, flight, wintering, nectar gathering, and pollination work of this Chinese bee. He also brought with him specimens of Apis florea Fab. and Apis dorsata Fab. from India, and Apis indica from India, Java, the Philippine Islands, and many parts of China. These are preserved in alcohol for anatomical and biometrical study. Starting June 14 with 27 queen bees of Apis indica taken from native colonies in Foochow, he reached Washington July 20 with 7 living queens. Of these 7, 3 survived and were introduced successfully into Italian colonies, and the first cycle of the Chinese brood is emerging. Apis indica differs in a number of respects from the bees commonly found in the United States and an effort will be made to carry them through the winter and if possible secure increase in the number of colonies for the proposed general study of this race of bees.

A. P. Sturtevant, in charge of the sublaboratory at Laramie, Wyo., reports the abnormal death of adult bees, including a large number of queens, in the vicinity of Casper, Wyo. Examination of these bees indicates a slight infestation of Nosema apis, but by no means enough to account for the death of so large a number of bees.

In connection with pollen-gathering studies conducted at the Laramie, Wyo., station, Russell Smith has devised a pollen catcher

"which combs the pollen from the legs of the bees as they enter the hive \* \* \*. Some 2,000 to 3,000 samples of pollen pellets are now being taken during the day twice a week. Of the samples collected, yellow and white sweet clover count for about 75 per cent of the total number of samples. Other pollen is being collected but in much smaller amounts from cleom, white Dutch clover, and dandelion. \* \* \* The bees have been found to collect certain kinds of pollen during certain hours of the day. \* \* \* The blooming periods of plants are being determined by the collection and identification of the pollen at the hive. An extensive collection of plants is being made at the same time and permanent mounts of the pollen from each plant are being made to assist in the identification of the pollen collected at the hive and to determine the nectar and pollen plants in the vicinity of the apiary."

Warren Whitcomb, jr., in charge of the Baton Rouge, La., sub-laboratory, reports that, contrary to the common conception, white clover in certain parts of the South produced nectar abundantly this year. White clover is usually considered strictly a northern honey plant.

E. L. Sechrist, acting in charge of the Davis, Calif., sublaboratory, reports a severe loss of bees in the buckeye region. Requeening, where it was tried, was apparently not efficacious in stemming the death of bees. and in order to save some of the experimental colonies it was necessary to give new queens and add fresh bees. In experiments conducted at Davis, with colonies under control, it was found that both the honey and pollen from buckeye have a serious effect upon brood rearing.

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